Remarks

Applicants wish to thank the Examiner for her review of claims 1-20 of the present application. Claims 1-20 are presently pending. Please note that claim 19 has been amended to correct an antecedent basis problem.

35 U.S.C. 112

The office action rejects claims 1-8 under 35 U.S.C. 112, second paragraph, as being indefinite stating that it is unclear how many valves are being claimed. The office action suggests that claim 1 recites one valve while claims 4-7 recite more than one valve.

Applicants note that only a single valve is being claimed. The valve claimed in claim 1 is a bi-directional valve that allows for the adjustment of pressures between a fluid within a crank case and a working space in a Stirling engine when the difference in pressures is greater than an absolute value. Claims 4-6 depend from claim 1 and reference a valve connection that includes a constriction, but does not reference a second valve. Claim 7 depends from claim 1 and references a spring that is within the valve and does not reference a second valve. Therefore, it is believed that no change needs to be made to the claims, since claims 1-8 reference only a single valve.

35 U.S.C. 102

The office action rejects claims 1-5, 8, and 11-17 as being anticipated by U.S. Patent No. 5,177,968 (Fellows patent).

The Fellows patent discloses a radial hot-gas engine that includes "an integral pump that scavenges working fluid from the crankcase reservoir and pressurizes the working cylinders when the engine is started, and maintains working pressure while the engine is in operation." *See Abstract*. The engine also includes "check valves, relief valves and an unloader valve

arrangement [to] control pressure, and equalize the pressure across the pistons when the engine is turned off by allowing the working fluid to return to the crankcase reservoir." *Id.*

The office action cites col. 5 lines 44-47 for teaching the present invention as described in the claims. Although a pressure-relief value is taught in this passage that "vents working fluid from the engine crankcase when crankcase pressure exceeds a preset maximum" and also a relief valve that "permits working fluid to bypass the solenoid valve and return to the crankcase whenever pressure in the working fluid exceeds a maximum." This passage does not teach the use of a single valve for "permitting fluid flow between the working space and the crankcase when an absolute value of a difference between the mean working space pressure and the crankcase pressure exceeds a specified value". The valve as claimed is a bi-directional valve that allows for fluid flow between the working space and the crankcase and the crankcase and the working space to equalize the pressure within these two regions when the differential pressure exceeds a predetermined threshold. The prior art reference teaches only two relief valves that each release pressure when a maximum pressure is exceeded. The combination of the two relief valves in the Fellows patent does not teach or suggest a single valve that balances the crankcase pressure and the mean working space pressure when the differential is exceeded by a predetermined amount. As a result independent claim 1 and each of its dependent claims is allowable over the Fellows patent.

With regard to independent claim 11, it is noted that this claim is directed to the use of a bi-directional valve that opens to allow fluid communication when a pressure difference between the crankcase and the working space is greater than a pre-defined value. As with claim 1, the Fellowes patent does not teach such a valve. Therefore claim 11 and its dependent claims 12-17 are not anticipated and allowable over the Fellowes patent.

The office action rejects claims 1-20 as anticipated by U.S. patent 5,755,100 (Lamos

patent).

The office action suggests that the invention is taught specifically at col. 4 lines 39-57 and col. 7 lines 8-22 of the Lamos patent. Applicants note that these passages again describe two valves and not a single valve as required by the claims. The first passage describes a ball valve 40 that is a "one-way valve" that "allows working gas to pass downward through the piston and into the space below it." col. 4 lines 45-52. The second passage describes a second valve, pressure control valve 52, that "allows the pressure of the working space to be decreased." col. 7 lines 16-17. Thus, the Lamos reference does not teach a single valve as required by the independent claims 1, 9, 11 and 19 that allows bi-directional flow of working fluid between a crankcase and a working space dependent on pressure differences. In independent claims 1 and 11, the difference in pressures must exceed a predefined threshold. In independent claims 9 and 19, when the pressure difference is at a first level fluid can flow between the crank case and the working space and when the pressure difference is at a second level, fluid can flow between the work space and the crankcase. As a result, dependent claims 2-8, 10, 12-18 and 20 are also allowable over the Lamos patent.

The office action suggests that claims 1, 3-11, and 13-20 are anticipated by U.S. patent 4,179,891 (Gronvall patent). As with the other two references, the Gronvall patent fails to teach a single valve that is has bidirectional fluid communication between a working space and a crankcase wherein fluid is communicated when a differential pressure between the work space and the crankcase exceeds a predetermined value. In fact, the office action specifically points to two separate valves 35, 52 and states that these valves "allow pressure regulating between the crankcase and the work space." These two valves allow for excessive pressure to be released in either the crankcase or the workspace. However, they do not allow a pressure differential to be maintained within a pressure range before fluid communication occurs.

As a result, claims 1, 3-11, and 13-20 are allowable over the art of record.

Applicants believe that all of the claim rejections have been addressed and a notice of allowance is respectfully requested.

Applicants believe that a 1 month extension of time is required, please charge Deposit Account No 19-4972 to cover the extension fees. If any additional fees are required for timely consideration of this application, please charge Deposit Account No. 19-4972.

Respectfully submitted,

/John J. Stickevers, #39,387/

John J. Stickevers
Reg. No. 39,387
Bromberg & Sunstein LLP
125 Summer Street, 11th Floor
Boston, MA 02110-1618
(617) 443-9292
Attorney for Applicants

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